IN THE UNITED STATES PATENT AND TRADEMARK OFFICE BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Applicant:	Jenoe Tihanyi	Examiner: Long Pham
Serial No.:	10/806,958	Group Art Unit: 2814
Filed:	March 23, 2004	Docket: I434.105.101/IFT976US
Due Date:	June 16, 2007	
Title:	LATERAL FIELD-EFFECT-CONTROLLABLE SEMICONDUCTOR COMPONENT FOR RF APPLICATIONS	

APPEAL BRIEF UNDER 37 C.F.R. § 41.37

Mail Stop Appeal Brief – Patents
Commissioner for Patents
P.O. Box 1450
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Dear Sir/Madam:

This Appeal Brief is submitted in support of the Notice of Appeal filed on April 9, 2007, appealing the final rejection of claims 1, 4-13, 16-24 of the above-identified application as set forth in the Final Office Action mailed February 8, 2007.

The U.S. Patent and Trademark Office is hereby authorized to charge Deposit Account No. 50-0471 in the amount of $500.00 for filing a Brief in Support of an Appeal as set forth under 37 C.F.R. § 41.20(b)(2). At any time during the pendency of this application, please charge any required fees or credit any overpayment to Deposit Account No. 50-0471.

Appellant respectfully requests consideration and reversal of the Examiner's rejection of pending claims 1, 4-13, 16-24.

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REAL PARTY IN INTEREST

The intellectual property embodied in the pending application is assigned to Infineon Technologies AG.

RELATED APPEALS AND INTERFERENCES

There are no other appeals or interferences known to Appellant that will have a bearing on the Board's decision in the present Appeal.

STATUS OF CLAIMS

In a Final Office Action mailed February 8, 2007, claims 1, 4-13, and 16-24 were finally rejected. Claims 1, 4-13 and 16-24 are pending in the application. Claims 1, 4-13 and 16-24 are the subject of the present Appeal.

STATUS OF AMENDMENTS

No amendments to the claims were proposed by Appellants or entered by the Examiner subsequent to final rejection.

SUMMARY OF THE CLAIMED SUBJECT MATTER

The subject matter of the independent claims involved in the Appeal is related to a semiconductor component.

One aspect of the present invention, as claimed in independent 1, provides a semiconductor component. The semiconductor component includes a semiconductor body (100) with a first semiconductor layer (110) of a first conduction type and a second semiconductor layer (112) of a second conduction type, which is applied on the first semiconductor layer (110) and forms a front side (101) of the semiconductor body (100). In the second semiconductor layer (112), there is a first terminal zone (20) of the second conduction type, a drift zone (40) of the second conduction type, a channel zone (30) of the first conduction type, which is formed between the first terminal zone (20) and the drift zone (40), and a second terminal zone (50) of the second conduction type, which is arranged at a distance from the channel zone (30) in a lateral direction of the semiconductor body (100).

A gate electrode (60) is arranged in a manner insulated from the semiconductor body (100) and adjacent to the channel zone (30). A plurality of auxiliary electrodes (70) are arranged at a distance from one another, and each formed in pillar-type fashion such that each auxiliary electrode (70) has a length and has a cross-section, wherein the dimensions of the auxiliary electrode (70) in the cross section extend in a lateral plane that is perpendicular to the length.

At least one of the plurality of auxiliary electrodes (70), which, proceeding from the front side (102), extends through the second semiconductor layer (112) right into the first semiconductor layer (110) and which is insulated from the semiconductor body (100). At least one of the plurality of auxiliary electrodes (70) has no dimension in the lateral plane that extends substantially beyond any other dimension in the lateral plane. *See Specification*, at page 7, line 11 through page 8, line 21; and Figure 1.

Another aspect of the invention, as claimed in independent claim 13, provides a semiconductor component. The semiconductor component includes a semiconductor body (100) having a first layer (110) of a first conduction type and a second layer (112) of a second conduction type, the second layer (112) applied onto the first layer (110) thereby forming a front side of the semiconductor body, a first terminal zone (20) of the second conduction type in the second layer (112), a drift zone (40) of the second conduction type in the second layer (112), a channel zone (30) of the first conduction type formed between the first terminal zone (20) and the drift zone (40), and a second terminal zone (50) of the second conduction type.

The second terminal zone (50) and the channel zone (30) are separated by a distance in a lateral direction on the front side of the semiconductor body (100). The semiconductor component also includes a gate electrode (60) insulated from the semiconductor body (100) and adjacent the channel zone (30) and a plurality of auxiliary electrodes (70) arranged at a distance from one another and each auxiliary electrode (70) formed in pillar-type fashion such that each have a length and each have dimensions in the lateral directions

All of the dimensions in the lateral directions are substantially smaller than the length and at least one auxiliary electrode (70) extends along its length from the front side (102) through the second layer (112) into the first layer (110) and insulated from the semiconductor body (100). *See Specification*, at page 7, line 11 through page 8, line 21; and Figure 1.

Another aspect of the invention, as claimed in independent claim 21, provides a semiconductor component. The semiconductor component includes a semiconductor body (100) having a first layer (110) of a first conduction type and a second layer (112) of a second conduction type, the second layer (112) applied onto the first layer (110) thereby forming a front side (102) of the semiconductor body. The semiconductor component includes a first terminal zone (20) of the second conduction type in the second layer, a drift zone (40) of the second conduction type in the second layer, a channel zone (30) of the first conduction type formed between the first terminal zone (20) and the drift zone (40), a second terminal zone (50) of the second conduction type, wherein the second terminal zone (50) and the channel zone (30) are separated by a distance in a lateral direction on the front side (102) of the semiconductor body (100), a gate electrode (60) insulated from the semiconductor body (100) and adjacent the channel zone (30), a plurality of auxiliary electrodes (70) arranged at a distance from one another and each configured in a substantially cylindrical shape.

At least one auxiliary electrode (70) extends from the front side (102) through the second layer (112) into the first layer (110) and insulated from the semiconductor body (100). *See Specification*, at page 7, line 11 through page 8, line 21; and Figure 1.

GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

I. Whether claims 1, 4-7, 12, 13, 17 and 18 are patentable under 35 U.S.C. § 102(b) over Yasuhara et al., European Patent No. 1073123 ("Yasuhara").

II. Whether claims 8-11, 19, and 20-24 are patentable under 35 U.S.C. § 103(a) over the combination of Yasuhara and Gajda et al., U.S. Patent Application Publication No. 2003/004255 (Gajda"), and Omura et al. European Patent No. 1168455 ("Omura").

ARGUMENT

I. The Applicable Law

With regard to a 35 U.S.C. § 102(b) anticipation rejection: "A person shall be entitled to a patent unless- (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of the application for patent in the United States." 35 U.S.C. § 102(b).

A rejection based on 35 U.S.C. § 102(b) can be overcome by: persuasively arguing that the claims are patentably distinguishable from the prior art; or, amending the claims to patentably distinguish over the prior art. M.P.E.P. § 706.02(b).

With regard to a 35 U.S.C. § 103 obviousness rejection: "Patent examiners carry the responsibility of making sure that the standard of patentability enunciated by the Supreme Court and by the Congress is applied in ***each and every case***." M.P.E.P. 2141 (emphasis original). The Examiner bears the burden under 35 U.S.C. § 103 in establishing a *prima facie* case of obviousness. *In re Fine*, 837 F.2d 1071, 1074, 5 USPQ2d 1596, 1598 (Fed. Cir. 1988).

Three criteria must be satisfied to establish a *prima facie* case of obviousness. First, the Examiner must show that some objective teaching in the prior art or some knowledge generally available to one of ordinary skill in the art would teach, suggest, or motivate one to modify a reference or to combine the teachings of multiple references. *In re Fine* at 1074. Second, the prior art can be modified or combined only so long as there is a reasonable expectation of success. *In re Merck & Co., Inc.*, 800 F.2d 1091, 231 USPQ 375, 379 (Fed. Cir. 1986). Third, the reference or combined references must teach or suggest all of the claim limitations. *In re Royka*, 490 F.2d 981, 180 USPQ 580 (C.C.P.A. 1974).

The court in *Fine* stated:

> Obviousness is tested by "what the combined teaching of the references would have suggested to those of ordinary skill in the art." But it "cannot be established by combining the teachings of the prior art to produce the claimed invention, absent some teaching or suggestion supporting the combination." And "teachings of references can be combined *only* if there is some suggestion or incentive to do so."

In re Fine, 5 USPQ2d at 1599 (citations omitted).

There must be some teaching somewhere that provides the suggestion or motivation to combine prior art teachings and applies that combination to solve the same or similar problem that it addresses. *In re Nilssen*, 851 F.2d 1401, 1403, 7 USPQ2d 1500, 1502 (Fed. Cir. 1988); *In re Wood*, 599 F.2d 1032, 1037, 202 USPQ 171, 174 (C.C.P.A. 1979). In particular, "The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based upon applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991); M.P.E.P. § 2142 (emphasis added).

The test for obviousness under § 103 must take into consideration the invention as a whole; that is, one must consider the particular problem solved by the combination of elements that define the invention. *Interconnect Planning Corp. v. Feil*, 774 F.2d 1132, 1143, 227 USPQ 543, 551 (Fed. Cir. 1985). Furthermore, claims must be interpreted in light of the specification, claim language, other claims, and prosecution history. *Panduit Corp. v. Dennison Mfg. Co.*, 810 F.2d 1561, 1568, 1 USPQ2d 1593, 1597 (Fed. Cir. 1987), *cert. denied*, 481 U.S. 1052 (1987). At the same time, a prior patent cited as a § 103 reference must be considered in its entirety, "*i.e.* as a *whole*, including portions that lead away from the invention." *Id.* That is, the Examiner must recognize and consider not only the similarities, but also the ***critical differences between the claimed invention and the prior art*** as one of the factual inquiries pertinent to any obviousness inquiry under 35 U.S.C. § 103. *In re Bond*, 910 F.2d 831, 834, 15 USPQ2d 1566, 1568 (Fed. Cir. 1990) (emphasis added). Finally, the Examiner must avoid hindsight. *Id.*

With regard for the test for obviousness under § 103, a statement that modifications of the prior art to meet the claimed invention would have been " '***well within the ordinary skill of the art*** at the time the claimed invention was made' " because the references relied upon teach that all aspects of the claimed invention were individually known in the art is not

sufficient to establish a *prima facie* case of obviousness without some objective reason to combine the teachings of the references. *Ex parte Levengood*, 28 USPQ2d 1300 (Bd. Pat. App. & Inter. 1993); M.P.E.P. § 2143.01 (emphasis original).

In conclusion, an applicant is entitled to a patent grant if any one of the elements of a prima facie case of obviousness is not established. The Federal Circuit has endorsed this view in stating: "If examination at the initial stage does not produce a prima facie case of unpatentability, then without more the applicant is entitled to grant of the patent." In re Oetiker, 977 F.2d 1443, 1446, 24 USPQ2d 1443, 1448 (Fed. Cir. 1992).

II. Rejection of Claims 1, 4-7, 12, 13, 17 and 18 under 35 U.S.C. §102(b) as being unpatentable over Yasuhara.

Applicant submits that Yasuhara fails to teach or suggest auxiliary electrodes arranged at a distance from one another and formed in ***pillar-type*** fashion. More particularly, Yasuhara fails for teach or suggest a plurality of auxiliary electrodes where there is ***no dimension in the lateral plane that extends substantially beyond any other dimension in the lateral plane***. In opposite, Yasuhara teaches plate-type electrodes with substantially larger dimensions in one direction of the lateral plane than in another direction of the lateral plane.

The Examiner has pointed to the film 14 in the Yasuhara reference, which are ***plate-type*** structures, as teaching the in ***pillar-type*** auxiliary electrodes. The pillar-type fashion is defined in claim 1 as having a length and a cross-section. The cross-sectional dimensions are defined by the claims as extending in a ***lateral plane*** that is ***perpendicular to the length***. This is simply not met by structures of Yasuhara.

As illustrated in Figures 1 and 2, the plate-type structure of film 14 extends between a body region 2 and a drain region 5. As such, they have a length that extends vertically as illustrated in Figure 2 (*See also*, Figures 4, 12 and 13, which also show length in the vertical direction). In this way, the cross-sectional dimensions extend in a lateral plane that is illustrated in Figure 1 by dimensions (w) and (L). Viewing the illustration of the lateral plane of Figure 1 of Yasuhara readily shows that one dimension in the lateral direction (L) is substantially larger than another dimension (w) in the lateral direction of the lateral plane. As such, Yasuhara fails to teach an auxiliary electrode where there is no dimension in the lateral plane that extends substantially beyond any other dimension in the lateral plane.

In view of the above, Appellant respectfully requests reversal of the rejection of independent claim 1 under 35 U.S.C. § 102(b). Dependent claims 4-7 and 12 further define patentably distinct independent claim 1. Accordingly, Appellant believes these dependent claims are also allowable over the cited reference. Appellant respectfully requests reversal of the rejection of claims 1, 4-7, and 12 under 35 U.S.C. § 102(b).

For the same reasons as discussed above with reference to claim 1, Appellant submits that Yasuhara fails to teach or suggest the invention recited by independent claim 13. Claim 13 defines a plurality of auxiliary electrodes arranged at a distance from one another and each auxiliary electrode formed in pillar-type fashion. ***Each*** electrode has a length and each has dimensions in the lateral directions. ***All of the dimensions in the lateral directions are substantially smaller than the length***. Again, it is now quite clear that the pillar-type feature specified in the claims is not taught or suggested by the plate-type structures in the Yasuhara et al reference, where the film 14 that has one dimension in the lateral direction (L) that is substantially larger than another dimension (w) in the lateral direction and larger than the "length" (which is the vertical dimension of film 14 illustrated in Figures 2, 4, 12 and 13).

Therefore, Applicant respectfully requests reconsideration and withdrawal of the 35 U.S.C. § 102(b) rejection to claims 1, 4, 5, 6, 7, 12, 13, 16, 17 and 18, and requests allowance of these claims.

In view of the above, Appellant respectfully requests reversal of the rejection of independent claim 1 under 35 U.S.C. § 102(b). Dependent claims 4-7 and 12 further define patentably distinct independent claim 1. Accordingly, Appellant believes these dependent claims are also allowable over the cited reference. Appellant respectfully requests reversal of the rejection of claims 1, 4-7, and 12 under 35 U.S.C. § 102(b).

III. Rejection of Claims 8-11, 19, and 20-24 under 35 U.S.C. §103(a) as being unpatentable over Yasuhara in view of Gajda and Omura.

Claim 21 specifies, *inter alia*, a plurality of auxiliary electrodes arranged at a distance from one another and each configured in a ***substantially cylindrical shape.*** As such, it is quite clear that the ***cylindrical shape*** specified in the claims is not taught or suggested by the ***plate-type*** structures in the Yasuhara et al reference, where the film 14 that has one dimension

in the lateral direction (L) that is substantially larger than another dimension (w) in the lateral direction such that a cylinder structure is not taught or suggested.

Furthermore, the plate-shaped "electrodes" (film 14) of Yasuhara do not function the same as do the claimed electrodes. As such, one skilled in the art would not be motivated to combine theses different configured and different functioning films (14) with the electrodes of Omura.

The plate-shaped "electrodes" (film 14) of Yasuhara are connected to source potential ***and*** to drain potential of the semiconductor component. As such, in Yasuhara, the auxiliary electrodes serve to control an accumulation channel along the plate electrode in the drift zone between the source and the drain zone of the semiconductor component (*See*, Abstract). On the other hand, the auxiliary electrodes of the claimed invention are only connected to ***one*** electrical potential and serve to reduce the gate-drain-capacitance of the semiconductor component and block a conducting channel in the drift zone when a blocking voltage is applied to the semiconductor component (see page 10, line 14, to page 11, line 2). Thus, the auxiliary electrodes of the present invention and of Yasuhara not only have significant geometrical differences but also have completely different functions.

As such, one skilled in the art would not be motivated to combine the film (14) of Yasuhara, which is differently configured and has different functions, with the electrodes taught in Omura.

In view of the above, Appellant respectfully requests reversal of the rejection of independent claim 21 under 35 U.S.C. § 103(a). Dependent claims 22-24 further define patentably distinct independent claim 21. Accordingly, Appellant believes these dependent claims are also allowable over the cited reference. Appellant respectfully requests reversal of the rejection of claims 21-24 under 35 U.S.C. § 103(a).

Finally, Dependent claims 8-11 and 19 further define patentably distinct independent claims 1 and 13 above. Accordingly, Appellant believes these dependent claims are also allowable over the cited reference. Appellant respectfully requests reversal of the rejection of claims 8-11 and 19 under 35 U.S.C. § 103(a).

CONCLUSION

For the above reasons, Appellant respectfully submits that the cited references neither anticipate nor render obvious claims of the pending Application. The pending claims distinguish over the cited references, and therefore, Appellant respectfully submits that the rejections must be withdrawn, and respectfully request the Examiner be reversed and claims 1-34 be allowed.

Any inquiry regarding this Brief should be directed to Paul P. Kempf at Telephone No. (612) 767-2502, Facsimile No. (612) 573-2005. In addition, all correspondence should continue to be directed to the following address:

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Respectfully submitted,

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Dated: July 16, 2007
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CLAIMS APPENDIX

1. (Previously Presented) A semiconductor component comprising:

a semiconductor body with a first semiconductor layer of a first conduction type and a second semiconductor layer of a second conduction type, which is applied on the first semiconductor layer and forms a front side of the semiconductor body;

in the second semiconductor layer, a first terminal zone of the second conduction type, a drift zone of the second conduction type, a channel zone of the first conduction type, which is formed between the first terminal zone and the drift zone, and a second terminal zone of the second conduction type, which is arranged at a distance from the channel zone in a lateral direction of the semiconductor body;

a gate electrode arranged in a manner insulated from the semiconductor body and adjacent to the channel zone; and

a plurality of auxiliary electrodes arranged at a distance from one another, and each formed in pillar-type fashion such that each auxiliary electrode has a length and has a cross-section, wherein the dimensions of the auxiliary electrode in the cross section extend in a lateral plane that is perpendicular to the length;

wherein at least one of the plurality of auxiliary electrodes, which, proceeding from the front side, extends through the second semiconductor layer right into the first semiconductor layer and which is insulated from the semiconductor body; and

wherein at least one of the plurality of auxiliary electrodes has no dimension in the lateral plane that extends substantially beyond any other dimension in the lateral plane.

2.-3. (Cancelled)

4. (Previously Presented) The semiconductor component of claim 2, wherein the plurality of auxiliary electrodes are completely surrounded by an insulation layer in the semiconductor body.

5. (Previously Presented) The semiconductor component of claim 2, wherein the plurality of auxiliary electrodes are connected to a defined potential.

6. (Previously Presented) The semiconductor component of claim 5, wherein the plurality of auxiliary electrodes and the first terminal zone are connected to the same potential.

7. (Previously Presented) The semiconductor component of claim 1, wherein the gate electrode is arranged above the front side of the semiconductor body.

8. (Previously Presented) The semiconductor component of claim 1, wherein the gate electrode is arranged in the semiconductor body.

9. (Original) The semiconductor component of claim 1, wherein the first semiconductor layer has a more heavily doped semiconductor layer of the first conduction type at a side remote from the second semiconductor layer.

10. (Previously Presented) The semiconductor component of claim 1, wherein at least one semiconductor zone of the first conduction type is arranged in the drift zone adjacent to the at least one auxiliary electrode.

11. (Original) The semiconductor component of claim 10, wherein the at least one semiconductor zone is arranged in the region of the front side of the semiconductor body.

12. (Previously Presented) The semiconductor component of claim 1, wherein the at least one auxiliary electrode is arranged nearer to the channel zone than to the second terminal zone.

13. (Previously Presented) A semiconductor component comprising:

a semiconductor body having a first layer of a first conduction type and a second layer of a second conduction type, the second layer applied onto the first layer thereby forming a front side of the semiconductor body;

a first terminal zone of the second conduction type in the second layer;

a drift zone of the second conduction type in the second layer;

a channel zone of the first conduction type formed between the first terminal zone and the drift zone;

a second terminal zone of the second conduction type, wherein the second terminal zone and the channel zone are separated by a distance in a lateral direction on the front side of the semiconductor body;

a gate electrode insulated from the semiconductor body and adjacent the channel zone; and

a plurality of auxiliary electrodes arranged at a distance from one another and each auxiliary electrode formed in pillar-type fashion such that each have a length and each have dimensions in the lateral directions, wherein all of the dimensions in the lateral directions are substantially smaller than the length;

wherein at least one auxiliary electrode extends along its length from the front side through the second layer into the first layer and insulated from the semiconductor body.

14.-15. (Cancelled)

16. (Previously Presented) The semiconductor component of claim 14, wherein the plurality of auxiliary electrodes are completely surrounded by an insulation layer in the semiconductor body.

17. (Previously Presented) The semiconductor component of claim 14, wherein the plurality of auxiliary electrodes are connected to a defined potential.

18. (Previously Presented) The semiconductor component of claim 17, wherein the plurality of auxiliary electrodes and the first terminal zone are connected to the same potential.

19. (Previously Presented) The semiconductor component of claim 13, wherein the gate electrode is arranged in the semiconductor body.

20. (Original) The semiconductor component of claim 13, wherein the first semiconductor layer has a more heavily doped semiconductor layer of the first conduction type at a side remote from the second semiconductor layer.

21. (Previously Presented) A semiconductor component comprising:

a semiconductor body having a first layer of a first conduction type and a second layer of a second conduction type, the second layer applied onto the first layer thereby forming a front side of the semiconductor body;

a first terminal zone of the second conduction type in the second layer;

a drift zone of the second conduction type in the second layer;

a channel zone of the first conduction type formed between the first terminal zone and the drift zone;

a second terminal zone of the second conduction type, wherein the second terminal zone and the channel zone are separated by a distance in a lateral direction on the front side of the semiconductor body;

a gate electrode insulated from the semiconductor body and adjacent the channel zone; and

a plurality of auxiliary electrodes arranged at a distance from one another and each configured in a substantially cylindrical shape;

wherein at least one auxiliary electrode extends from the front side through the second layer into the first layer and insulated from the semiconductor body.

22. (Previously Presented) The semiconductor component of claim 21, wherein each of the plurality of auxiliary electrodes have a substantially circular cross-section.

23. (Previously Presented) The semiconductor component of claim 1, wherein each of the plurality of auxiliary electrodes are configured in a cylindrical shape.

24. (Previously Presented) The semiconductor component of claim 13, wherein each of the plurality of auxiliary electrodes are configured in a cylindrical shape.

EVIDENCE APPENDIX

None.

RELATED PROCEEDINGS APPENDIX

None.